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# Impact of an employment guarantee scheme on utilisation of maternal healthcare services: Results from a natural experiment in India

Divya Parmar<sup>a,\*</sup>, Aneesh Banerjee<sup>b</sup>

<sup>a</sup> School of Health Sciences, City, University of London, UK

<sup>b</sup> Cass Business School, City, University of London, UK

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## ABSTRACT

We assess the impact of India's National Rural Employment Guarantee (NREG) scheme, the world's largest workfare scheme, on healthcare utilisation – specifically maternal healthcare. The primary objective of NREG is to improve the income of rural households by guaranteeing 100 days of employment. We expect that by improving household income, thereby reducing some of the financial barriers, such as out-of-pocket payments, NREG can increase utilisation of maternal health services. Using a nationally representative household survey and a difference-in-differences approach that exploits the phased rollout of the scheme, we estimate the impact of NREG on utilisation of maternal health services: mainly deliveries at health facilities. We find that NREG did not increase overall facility deliveries, even though it led to an increase in deliveries at public facilities. There is weak evidence to suggest that deliveries at private facilities reduced due to NREG. Furthermore, sub-group analyses reveal that among poorer households, who are more likely to participate in NREG, there is a reduction in facility deliveries while home deliveries increased. Among richer households, NREG increased deliveries at public facilities. There was no impact on households belonging to marginalised castes. We conclude by discussing the possible mechanisms for these effects and its impact on equity in healthcare utilisation.

## 1. Introduction

Targeted transfers such as Employment Guarantee Schemes (EGS) are often seen as a mechanism to achieve a number of developmental objectives: provide employment to the poor, break the cycle of poverty and create productive assets. Evidence shows that EGS schemes in developing countries such as Argentina (Ravallion et al., 2005) and South Africa (Adato and Haddad, 2002) have had varying degrees of success in achieving these objectives. More recently, researchers have started investigating the effects of such schemes on other developmental outcomes including education (Afridi et al., 2016; Das and Singh, 2013), food security (Deininger and Liu, 2013; Ravi and Engler, 2015), and health (Maity, 2017; Sharma, 2016). As its conceptual basis, research investigating the impact of EGS as well as other workfare or cash-transfer schemes on health utilisation, propose that the effect is primarily the result of an improvement in the income of the household. When members of a household participate in an EGS, their income improves, and they are more likely to afford and utilise healthcare.

In this paper, we assess the impact of one of the largest EGS ever implemented: India's Mahatma Gandhi National Rural Employment Guarantee Scheme (NREG), on utilisation of health services. As in the

case of other EGS, one of the primary objectives of NREG is to provide income security to the most vulnerable sections of the population while developing productive assets. Evidence shows that NREG has had an impact on meeting this objective. Not only are the poor and marginalised caste more likely to participate in NREG (Jha et al., 2009; Liu and Barrett, 2012), their income has also increased (Muralidharan et al., 2017). Furthermore, research shows that by prioritising infrastructure development projects, the scheme also enables sustainable development of the community (Bhatia et al., 2016).

However, evidence on the effects of NREG on other development outcomes such as health is lacking. In this paper, we address this gap in evidence by studying the impact of NREG on healthcare utilisation. NREG guarantees adult participants, both men and women, from rural households one hundred days of work each year. By guaranteeing gainful employment, especially during the lean agricultural season and at a wage rate that is often higher than the minimum wage, NREG promises to improve income security of poor households in rural areas; therefore, reducing economic barriers to utilising healthcare. This expected effect of NREG on the utilisation is particularly relevant in India where healthcare is largely financed through out-of-pocket (OOP) payments and with increasing dependence on the private sector

\* Corresponding author. School of Health Sciences City, University of London, Northampton Square, London, EC1V 0HB, UK.

E-mail addresses: [divya.parmar@city.ac.uk](mailto:divya.parmar@city.ac.uk) (D. Parmar), [aneesh.banerjee@city.ac.uk](mailto:aneesh.banerjee@city.ac.uk) (A. Banerjee).

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providers, healthcare costs are rising, and OOP payments are one of the leading causes of household debt and poverty. It is estimated that paying for healthcare pushes nearly 39 million Indians below the poverty line every year (Balarajan et al., 2011).

To understand the effect of NREG on utilisation of health services, we focus on maternal healthcare, mainly delivery at health facilities. When NREG was introduced, only 39% of the deliveries in India were conducted in health facilities; in rural areas it was just 29%. We also study the differential effect of NREG by household wealth and caste. Research shows that while schemes that promote facility deliveries by providing cash incentives and free maternity care reduce some of the barriers to seeking maternal healthcare, high OOP payments can still be a stubborn deterrent (Mohanty and Srivastava, 2012). This deterrent is more significant for poorer households – often from rural areas and belonging to marginalised castes, leading to greater inequity in utilisation of maternal healthcare (Modugu et al., 2012).

In line with the objectives of an EGS like NREG; first, we expect to see an increase in utilisation of maternal healthcare. This can be due to a number of reasons including a direct effect from the increase in income of participating households to an indirect effect on the entire community. The indirect effect includes increase in overall wages in the area, as well as better access to health facilities because of the infrastructure development undertaken as part of the NREG work. Second, we expect NREG to reduce inequity in utilisation. Since the scheme is specifically designed to provide poorer households greater income security, we expect that because of NREG poorer households are more likely to afford and use healthcare, thereby reducing inequity in utilisation.

In the following sections, we describe the study setting and the NREG scheme, and present our empirical strategy which uses a difference-in-difference approach to assess the impact of NREG on utilisation of maternal healthcare, specifically deliveries at health facilities. We then present the results, which shows that although there is no change in overall facility deliveries – deliveries at public facilities have increased due to NREG. However, in the subgroup analyses, we find results contrary to our expectations. Amongst poorer households, we find that facility deliveries decreased – including at public facility, while home deliveries increased. Instead, amongst richer households, we find deliveries at public facility increased but there is no impact on home deliveries. Finally, we discuss the results in light of further analyses and extant literature to understand possible mechanisms that explain these results.

## 2. Methods

### 2.1. Study setting

India, with a population of 1.3 billion, is the second populous country and the largest democracy in the world. Close to 70% of its population live in villages, where agriculture, including livestock, is the principal source of livelihood. India's development indicators are poor. Overall 22% of its population live below the poverty line and in 2015, it accounted for 15% of all maternal deaths worldwide (WHO, 2015).

Over the years, many poverty reduction projects have been initiated in India. One of the largest and perhaps the most ambitious is the NREG scheme. Enacted by the Indian Parliament in 2005, NREG aims to provide income security to households in rural areas. With an annual budget of nearly 7 billion USD, during its first year of implementation in 2006, nearly 21 million people were provided employment, and this increased to 54.9 million by 2010 (Ministry of Rural Development, 2010). This makes NREG one of the largest workfare programme in the world.

The scheme legally guarantees one hundred days of wage employment to every rural household with adult members willing to perform unskilled manual work. The nature of work i.e. unskilled manual labour screens out non-poor households while increasing the likelihood of

households who self-identify as poor to participate. Women and marginalised caste groups i.e. scheduled castes and scheduled tribes (SC/ST) are prioritised for work and consequently, since 2009, they constitute almost half of the participants (Ministry of Rural Development, 2010). The scheme is available in only rural areas and is managed by the decentralised institutions in the village (*Gram Panchayats*) that ensure employment is provided within fifteen days of application and within 5 km of the household. Otherwise, households are entitled to claim unemployment or travel allowance. Employment is in the public sector with priority given to developmental work in water conservation and harvesting, drought proofing, irrigation, land development, flood control, and improving all-weather access.

The implementation of NREG has partially met the targets that were initially set out. For instance, the recorded number of days worked under NREG is much lower than the target of one hundred days. In its first year of implementation, participating households were employed for only 43 person days on average, which increased to 48 days by 2008/09 (World Bank, 2011). Only 10 per cent of participating households exhausted their hundred days' entitlement in 2006/07, which increased to 14 per cent by 2008/09. Furthermore, while awareness of NREG is relatively high, awareness of some key elements of the scheme remains low. For example, people know about the one hundred days of guaranteed work but are not aware of their entitlement to an unemployment allowance if work is not provided within fifteen days (World Bank, 2011).

A number of researchers acknowledge that while the implementation of NREG is not perfect, it has still achieved significant progress in the overall development objectives. There is a growing body of evidence to suggest a net positive impact of NREG on the overall development of rural poor households in several areas such as food security (Ravi and Engler, 2015), reducing stress migration to urban cities (NCEUS, 2009), reducing child labour (Uppal, 2009) and increasing access to education (Afridi et al., 2016). Some studies have also highlighted the crucial role of the scheme in breaking the cycle of poverty. For instance, evidence suggests that in certain villages in Andhra Pradesh, a state that is prone to catastrophic crop failure, which is often to blame for extreme poverty and farmer suicides, 85 percent of the NREG wages were being spent on food, clothing, health, education and debt repayment (Kannan and Berman, 2013) – indicating how the income from the scheme is often used in meeting the basic needs of the household. A larger national study further found the majority of the NREG participants are relatively more vulnerable such as from poorer households, SC/ST, or women (NCEUS, 2009).

### 2.2. Empirical strategy

To estimate the impact of NREG by comparing beneficiaries and non-beneficiaries would give biased estimates as the scheme was not randomised. However, the phased rollout of the scheme provides a quasi-natural experimental design which we can exploit. NREG was rolled out in three phases. In Phase 1 (February 2006), the scheme was introduced in 200 backward districts; an additional 130 districts were included in Phase 2 (April 2007), and the remaining districts were included in Phase 3 (April 2008). We employ difference-in-differences (DID) that uses the fact that the scheme was implemented in different districts at different times to distinguish between the “treatment” and “control” districts. We use Phase 1 districts as the treatment group and Phase 3 districts as the control group and consider January 2004 to January 2006 as the pre-intervention period i.e. period before the launch of NREG and April 2007 to March 2008 as the post-intervention period when NREG was available in the treatment districts but not in the control districts (Fig. 1). We use the second year of NREG in Phase 1 districts as the post-intervention period to avoid programme implementation glitches that may have been present in the first year of implementation.

Our DID model uses the following equation:

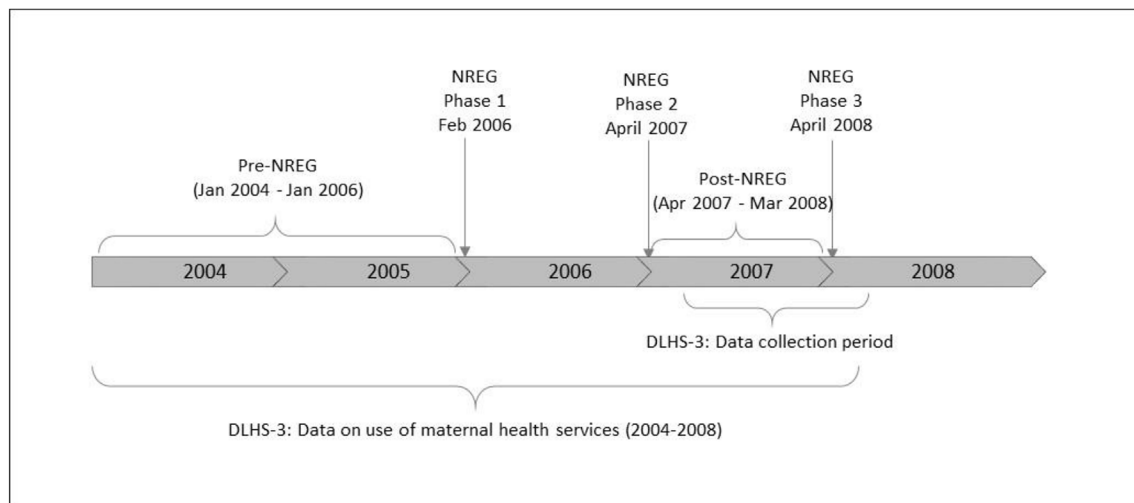


Fig. 1. Timeline of the National Rural Employment Guarantee (NREG) and DLHS survey.

$$y_{itd} = \alpha + \beta(NREG_{dt} \cdot post_t) + \delta_d + \gamma_t + \mathbf{X}_{itd} + \varepsilon_{itd} \quad (1)$$

$y_{itd}$  refers to the dependent variable for an individual  $i$  in district  $d$  in time  $t$ . The binary variable  $NREG_{dt}$  takes the value 1 for districts that received NREG in Phase 1 and 0 for districts that received NREG in Phase 3. The binary variable  $post_t$  takes the value of 1 for the post-NREG period (April 2007–March 2008) and 0 for the pre-NREG period (January 2004–January 2006). Unobservable effects common to all districts are captured by the district fixed effects (FE),  $\delta_d$  and unobservable effects common to all districts in a year are captured by the year FE,  $\gamma_t$ . Matrix  $\mathbf{X}_{itd}$  is the set of control variables. The main coefficient of interest is  $\beta$ , which gives the treatment effect of NREG. Specifically, it gives the “intent-to-treat” (ITT) which is the average effect of the treatment on the outcome of interest for all individuals in the treatment districts, irrespective of their participation in the scheme. Thus, ITT captures the impact on all individuals where NREG is implemented. We use a linear probability model as the interpretation of interaction terms is controversial in non-linear probit or logit models (Ai and Norton, 2003). Standard errors are robust and clustered at the district and household levels to account for serial correlation and weights are used to adjust for survey sampling.

It was envisaged that NREG would be introduced in the most backward districts first. When NREG was introduced, our data shows Phase 1 districts had worse indicators than Phase 3 districts. Since, the criteria used in identifying backward districts is not explained in the policy, many studies have opted for a DID approach (Azam, 2012; Bose, 2017). DID has its advantage as it does not require the treatment and control groups to have the same pre-intervention conditions, which are controlled by district FE. However, for a DID results to be valid, it should meet the parallel trends assumption i.e. districts in different phases should have the same growth rates prior to NREG. Otherwise, outcomes in the treatment and control groups could have been different even in the absence of the scheme, resulting in biased estimates.

Furthermore, we conduct two robustness checks. First, we run DID, comparing Phase 2 as treatment to Phase 3 as control districts. Since backward districts could have been prioritised for Phase 1, it is likely that Phase 2 and 3 districts are more similar. For this analysis, we consider January 2004 to February 2007 as the pre-intervention period when NREG was not available in both Phase 2 and 3 districts and April 2007 to March 2008 as the post-intervention period when NREG was available in Phase 2 but not in Phase 3 districts. Second, as a falsification test, we run DID for urban areas using the main model specification. Since NREG is not available in urban areas, the DID estimate should be insignificant.

### 2.3. Sub-group analyses

To explore heterogeneity of impact, we conduct two sub-group analyses. Given that previous studies have reported low utilisation of health services among poor and socially disadvantaged households (Kesterton et al., 2010), we assess differential impacts of NREG for these groups (poor and SC/ST). Since NREG provides manual work that deters richer households from participating and because SC/ST are prioritised for employment in NREG, we expect the poor and SC/ST to benefit more from NREG and expect their healthcare utilisation to increase.

### 2.4. Further analyses to test mechanisms

We conduct additional analyses to test possible mechanisms. First, we expect that the introduction of NREG not only improves income it also improves the infrastructure in a community that benefits everyone. If this line of reasoning is correct, then NREG would have a greater impact in regions where the infrastructure is likely to be weaker. Within the constraints of the available data, we believe regions prone to natural disasters such as floods and droughts are likely to have weaker infrastructure. Therefore, we analyse regions that are prone to natural disasters. We identify disaster-prone regions using a variable that records if there was a flood or a drought in 2006 or 2007 in the primary sampling unit. Second, given the unexpected result that facility deliveries reduced among poorer households, we test if this effect could be because adult members find the opportunity cost of travelling to and waiting at health facilities, while foregoing employment, too high. One way to test this mechanism is to assess if NREG has reduced time allocated towards other maternal and childcare activities such as exclusive breastfeeding, which is also likely to keep an adult member away from employment. Therefore, we estimate the impact of NREG on duration of exclusive breastfeeding.

### 2.5. Data

The data comes from the Indian District Level Household and Facility Survey (DLHS), one of the largest nationally representative demographic and health surveys carried out in India. It is a repeated cross-sectional survey and we use the data from DLHS-3 that was administered in 2007–2008. It covered 720,320 households across 601 districts and 28 states and six union territories (excluding Nagaland). The sampling frame was based on the 2001 census and used multistage stratified sampling. In each district, 50 Primary Sampling Units (PSUs) – census villages for rural areas and wards for urban areas – were selected

by systematic Probability Proportional to Size (PPS) sampling and within each sampled PSU, households were selected by circular systematic sampling (Ministry of Health and Family Welfare, 2010). Ethical approval was not sought as the data is available in the public domain.

DLHS-3 provided individual, household and village information. Basic demographic and socioeconomic information was collected from household members. All ever-married women (aged 15–49) in the household were interviewed regarding their use of maternal health services for the most recent birth in the last five years. We use this information to create records of children born using their month and year of birth. As NREG was implemented in only rural areas, we restrict our sample to rural households. We, therefore, have data on 127,879 children born during 2004–2008, covering the period before and after the implementation of NREG (Fig. 1). For year 2008, we include birth data up to March 2008, before Phase 3 of NREG started.

## 2.6. Variables

Our dependent variables measuring utilisation of healthcare are selected based on the indicators available for a period of time, before and after NREG was introduced. We study deliveries at health facilities and include two additional variables: deliveries at home and borrowing to cover facility delivery costs. Previous studies found strong financial barriers to facility deliveries for poor and marginalised caste groups (Kesterton et al., 2010). Since NREG aims to increase the income of rural poor households, we expect to observe an increase in facility deliveries, consequently a reduction in home deliveries, and a reduction in the incidence of borrowing for these households. Mothers who reported a facility delivery were asked if they borrowed money or sold assets to cover costs related to facility deliveries, including out-of-pocket costs. We have used this question to construct the borrow variable.

We control for several child, mother and household characteristics, which in previous studies have shown to be strong determinants of utilisation of health services. These include sex of the child, religion and caste of the household head, and mother's education, age at birth of child, and number of previous births. We also control for household size and wealth. For household wealth, we use the asset-based wealth index provided in the DLHS. It is based on household ownership of durable assets and housing conditions (e.g. water source and toilet facilities) and is calculated using principal component analysis (Ministry of Health and Family Welfare, 2010). We use this index to create wealth quintiles. This indicator reflects the relative wealth of the household as compared to other households in the region. Due to the low level of schooling in India, mothers' education is coded as never attended school vs ever attended school. (See Table 1 for variable descriptions).

## 3. Results

### 3.1. Descriptive statistics

As seen from Table 1, in our sample, 37.32% of the deliveries were at a health facility (22.43% in public and 14.61% in private) while majority were home deliveries (61.15%). There is an increase in facility deliveries in both Phase 1 (treatment) and Phase 3 (control) districts after NREG – from 24.56% to 37.44% in Phase 1 and from 41.74% to 52.46% in Phase 3. Consequently, home deliveries have also reduced in both Phase 1 and 3 districts after NREG. For 38% of the facility deliveries, households had to borrow money or sell assets, and this became worse in both Phase 1 and 3 districts after NREG. Regarding other indicators, our sample has more male (53.72%) than female children. Close to 41% of the sample is SC/ST and above 80% is Hindu. Only half of the mothers ever attended school and this increased after NREG. Mother's average age at birth is 25 years, similar in both sets of districts.

### 3.2. Parallel trends

As shown in Fig. 2, the yearly mean of deliveries at a health facility, public facility, at home, and borrowing are roughly parallel in the treatment (Phase 1) and control (Phase 3) districts in 2004–2005 i.e. before the introduction of NREG. This implies these indicators meet the parallel trends assumption and DID can be applied to estimate the impact of NREG. However, deliveries at private facilities do not show parallel trends and therefore we cannot convincingly conclude the change in private facility deliveries is caused by NREG. Hereafter, results pertaining to private facility deliveries are shaded as these results need to be interpreted with caution.

### 3.3. Impact of NREG on maternal healthcare

The difference-in-differences estimates on the impact of NREG on utilisation of maternal healthcare are shown in Table 2. We observe that there is no impact of NREG on facility deliveries per se (column 1) but if we disaggregate by the type of facility, we find deliveries in the public facilities increased by 2.6 percentage points (column 2) while there was no impact of NREG on home deliveries (column 4). Even though we are unable to claim a causal impact of NREG on reduction in private facility deliveries, the results suggest the increase in public facility deliveries is likely due to the reduction in deliveries at private facility – rather than a shift from home to facility delivery. This suggests that the introduction of NREG did not significantly increase utilisation of facilities, but it may have shifted preference from private to public facilities. From the results, we also find that due to the introduction of NREG, borrowing for facility deliveries reduced by 2.1 percentage points (at 10% significance, column 5).

### 3.4. Robustness checks

Table 3 presents the results of the falsification test i.e. estimating the impact of NREG in urban areas. Since urban areas were not offered NREG, as expected, we do not find any impact on facility deliveries including in public facilities, and no impact on borrowing. However, there is a reduction in home deliveries by 2.1 percentage points at 10% significance.

Using Phase 2 districts as treatment and Phase 3 districts as control (Table 4), we find NREG had a similar trend as our main results, but the effect size is larger: facility deliveries increased by 3.3 percentage points, public facility deliveries by 4.7 percentage points, home deliveries reduced by 3.4 percentage points while there was no change in borrowing. In our main specification where we consider Phase 1 districts as treatment, although the coefficients had the same signs as above, the coefficients were smaller. We also found no change in home deliveries while a decline in borrowing. This implies NREG had a larger impact on facility deliveries in Phase 2 districts than in Phase 1 districts. This may be because, on an average, Phase 1 districts were more backward compared to Phase 2 districts, and hence implementation of NREG could have been better in Phase 2 districts. It is also possible that implementation of NREG improved over time and by the time it was introduced in Phase 2 districts, it was running more smoothly.

### 3.5. Sub-group analyses

As seen in Table 5, among poorer households (wealth quintiles 1 and 2) facility deliveries reduced by 2.9 percentage points, with a reduction of 1.8 percentage points in public facility deliveries. Consequently, deliveries at home increased by 2.7 percentage points. There was no significant impact on borrowing. Contrary to our expectations, this result indicates that utilisation of facility delivery amongst poorer households reduced due to NREG. We explore possible reasons for this observation in the mechanisms section.

For rich households (wealth quintiles 4 and 5), although there was



**Table 1**  
Variable definitions and descriptive statistics.

(1)		(2)	(3)	(4)		
Variables		Overall	Phase 1 districts (Treatment)		Phase 3 districts (Control)	
		N = 127,879	N = 68,193		N = 59,686	
			Pre-NREG	Post-NREG	Pre-NREG	Post-NREG
Panel A: Dependent Variables						
Facility	Delivery in a health facility = 1; 0 otherwise	37.32	24.56	37.44	41.74	52.46
Public	Delivery in a public health facility = 1; 0 otherwise	22.43	14.02	26.25	23.45	31.81
Private	Delivery in a private health facility = 1; 0 otherwise	14.61	10.36	10.84	18.02	20.29
Home	Delivery at home = 1; 0 otherwise	61.15	72.86	61.86	55.84	46.99
Borrow	Borrowed money or sold assets to cover costs associated with facility delivery = 1; 0 otherwise	38.36	43.15	44.26	32.94	35.51
Panel B: Independent Variables						
Male	Child born is a boy = 1; 0 if girl	53.72	54.77	51.74	57.23	51.75
SCST	Household head belongs to ST/SC = 1; 0 otherwise	40.77	45.28	46.77	33.80	35.38
Size	No of members in the household	7.00	6.82	7.18	6.85	7.27
Education	Mother has ever attended school = 1; 0 otherwise	50.42	40.95	43.85	58.33	61.03
Age	Mother's age at birth	25.01	25.50	24.72	25.58	24.59
Births	No of previous births of the mother	2.59	2.89	2.55	2.66	2.32
Religion	Religion of the household head					
	Hindu	82.75	84.31	84.13	81.81	80.96
	Muslim	12.32	11.42	11.92	12.26	13.32
	Christian	4.93	4.27	3.95	5.92	5.83
Wealth	Household wealth quintiles					
	Q1 (poorest 20%)	24.85	35.10	34.83	13.28	12.76
	Q2	24.13	28.09	28.75	18.94	19.18
	Q3	22.24	19.22	19.94	24.95	25.90
	Q4	18.63	12.43	12.06	25.43	26.22
	Q5 (richest 20%)	10.15	5.15	4.41	17.40	15.93

Notes: Percentages for categorical variables and means for continuous variables; unweighted. Scheduled Castes or Scheduled Tribes (SCST).

no impact on overall facility deliveries, public facilities deliveries increased by 4.0 percentage points. There was no impact on home deliveries and like poorer households, there was no impact on borrowing. Even though we cannot be certain about the causal link that NREG led to a decrease in private facility deliveries among richer households, the results suggest that richer households may have shifted from private to public facility. Since richer households are less likely to participate in NREG, our results indicate they may have benefitted from indirect effects of NREG such as overall development that may have improved access to health facilities. We explore this line of reasoning further under mechanisms.

With regards to caste, there was no impact of NREG for marginalised castes (SC/ST) while non-SC/ST showed similar trends as richer households: public facility deliveries increased by 4.2 percentage points while there was no impact on facility and home deliveries. For non-SC/ST borrowing reduced by 3.9 percentage points.

### 3.6. Mechanisms

As some of the sub-group analyses results were unexpected, we ran additional analyses to explore two possible mechanisms. First, to test the assumption that infrastructure development due to NREG positively influences the utilisation of health facilities, we had a closer look at regions that are prone to disasters (Table 6). Disasters such as floods and droughts adversely impact infrastructure – and since NREG work prioritises development of infrastructure damaged in disasters or build infrastructure to protect from the adverse impact of disasters, we can expect the impact of NREG on maternal healthcare to be greater in disaster-prone districts. Even though this approach has limitations, which are discussed later, the results lend support to our argument. We find NREG increased deliveries at public facilities by 3.7 percentage points in disaster-prone regions compared to an increase of 1.9 percentage points in regions that are not disaster-prone. Furthermore, in disaster-prone regions, NREG increased facility delivery by 2.4

percentage points while reducing home deliveries by 2.8 percentage points. This indicates that the availability of good public infrastructure, often developed as part of NREG, can reduce barriers to facility utilisation. Finally, NREG also reduced borrowing in disaster-prone regions by 4.2 percentage points, indicating that NREG may have provided some financial protection in the rural areas that are prone to disasters.

Second, to test the assumption that introduction of NREG negatively impacts allocation of household members' time for maternal and child health, we tested the impact of NREG on exclusive breastfeeding: whether the child was exclusively breastfed for at least the first six months after birth. The results indicate there was a 2.4 percentage point reduction in exclusive breastfeeding due to NREG (Table 7). But what is particularly relevant to our argument is that amongst poorer households there was a 2.7 percentage point reduction while there was no impact on richer households. Furthermore, if the opportunity cost of not being employed explains the negative impact of NREG on facility deliveries amongst poorer household, then we would not expect to see this effect among richer households that are less likely to be direct beneficiaries of NREG. The sub-group analysis of richer households presented in Table 5 confirms this view that there is no negative impact on facility and home delivery.

## 4. Discussion

In this study we investigated the impact of NREG on utilisation of maternal healthcare. We expected NREG to have a positive influence on maternal health-seeking behaviour – specifically facility delivery due to two main reasons: improvement in income and improvement in infrastructure. First, NREG led to an increase in income as it provides employment during the lean season and it has also increased unskilled wage rate for everyone in the region (Berg et al., 2012; Imbert and Papp, 2015). By mandating equal wages irrespective of individual characteristics such as gender or caste, an implicit objective of the scheme is also to enforce a minimum wage that is often set above the

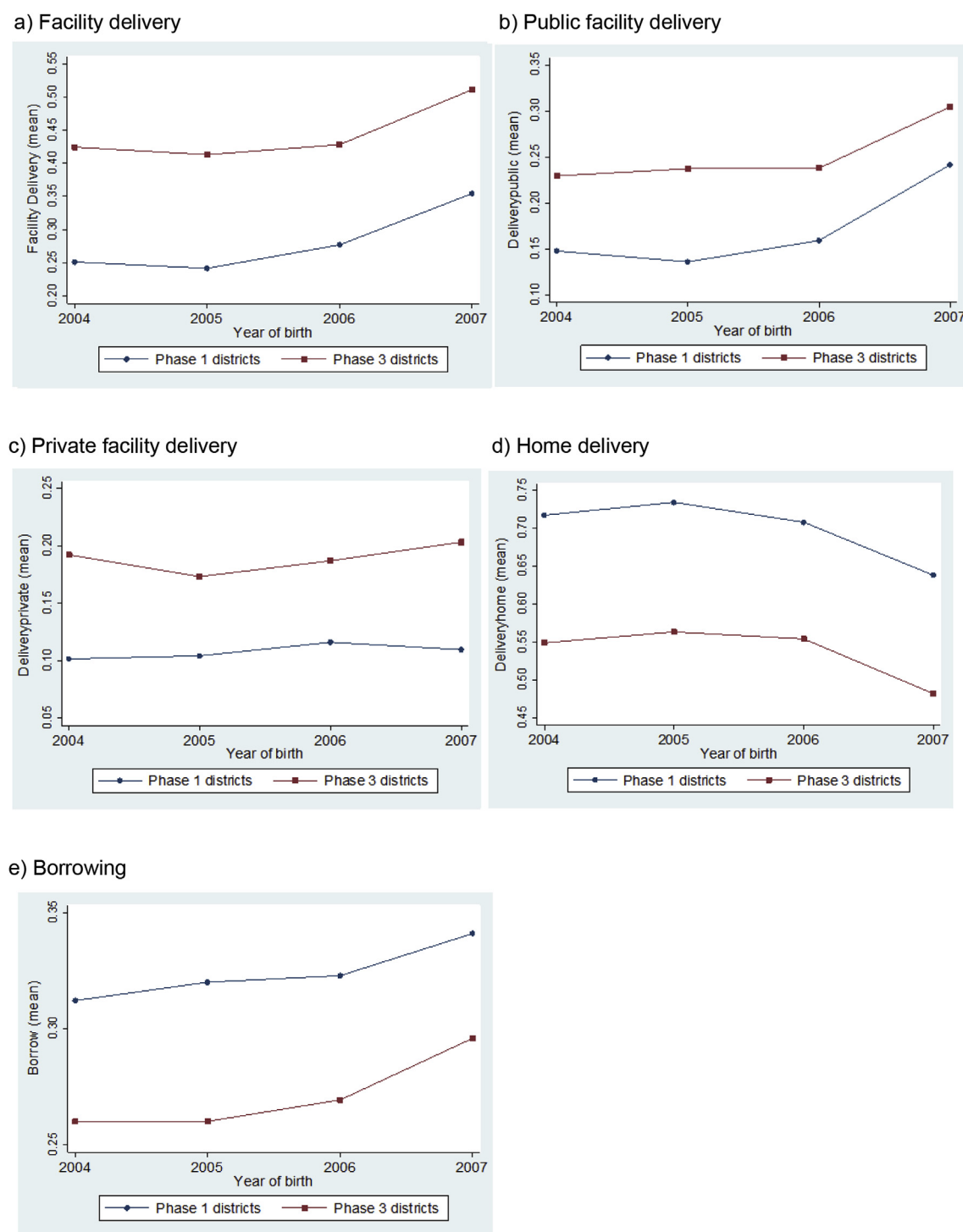


Fig. 2. Test of parallel trends between Phase 1 (treatment) and Phase 3 (control) districts before the introduction of NREG in February 2006.

current unskilled wage rate and therefore reduces wage discrimination in rural areas. Furthermore, the NREG Act encourages participation of women in the workforce by offering uniform wages across gender (p.16) and mandating that a third of the NREG beneficiaries must be women (p.14). This increases women's participation in NREG – especially among the rural poor (Afridi et al., 2016) and as Zimmermann (2012) highlights, this has resulted in women's wages to increase substantially, making it more attractive for women to join the labour force. Muralidharan et al. (2017) go on to show that while the wages for poor households increased by 13 percent, it is overwhelmingly driven by the market (90%) as opposed to the earnings from the programme (10%).

In essence, the increase in wage rates due to the introduction of NREG benefits the whole community. Second, the NREG Act (2005) prioritises infrastructure development that also benefits the entire community (p.13). For instance, in a predominantly agrarian economy, irrigation and flood protection, work prioritised in NREG, can prevent catastrophic shocks to the region and improve rural employment and incomes.

#### 4.1. Impact on maternal healthcare

From the results, we observe an increase in preference towards

**Table 2**  
Impact of NREG on utilisation of maternal health services: Difference-in-differences estimates.

	(1)	(2)	(3)	(4)	(5)
	Facility	Public	Private	Home	Borrow
DID	0.004 (0.006)	0.026*** (0.006)	−0.023*** (0.005)	−0.005 (0.006)	−0.021* (0.012)
District FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	77,355	77,948	77,948	78,053	29,365
R-squared	0.305	0.176	0.243	0.299	0.174

Notes: Controls include sex of the child, household head's religion and caste, household size, household wealth, and mother's characteristics (education, age at birth and number of previous births). Standard errors are in parenthesis. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1.

**Table 3**  
Falsification test: Impact of NREG in urban areas.

	(1)	(2)	(3)	(4)	(5)
	Facility	Public	Private	Home	Borrow
DID	0.020 (0.012)	0.014 (0.013)	0.006 (0.013)	−0.021* (0.012)	−0.017 (0.015)
District FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	26,777	26,905	26,905	26,944	18,875
R-squared	0.354	0.200	0.296	0.350	0.169

Notes: Controls include sex of the child, household head's religion and caste, household size, household wealth, and mother's characteristics (education, age at birth and number of previous births). Standard errors in parenthesis. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1.

**Table 4**  
Impact of NREG: Comparing phase 2 (treatment) and phase 3 (control) districts.

	(1)	(2)	(3)	(4)	(5)
	Facility	Public	Private	Home	Borrow
DID	0.033*** (0.006)	0.047*** (0.006)	−0.014*** (0.004)	−0.034*** (0.006)	0.006 (0.010)
District FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	91,349	92,059	92,059	92,181	36,945
R-squared	0.309	0.179	0.242	0.302	0.169

Notes: Controls include sex of the child, household head's religion and caste, household size, household wealth, and mother's characteristics (education, age at birth and number of previous births).

Standard errors in parenthesis. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1.

deliveries at public facilities. We expect this is due to the development of infrastructure in the community that is carried out as part of NREG projects. This is also in line with prior literature from India suggesting that with improvement in infrastructures such as road connectivity and flood control; people are more likely to access larger public facilities, usually main hospitals in towns that are perceived to provide better quality of care (Shah and Jose, 2009). Therefore, instead of going to smaller private nursing homes, which are often unregulated and expensive, people prefer to go to public hospitals (Iyengar et al., 2009).

In addition, the sub-group analysis of disaster-prone regions is particularly useful. In a largely subsistence agriculture economy, disasters can have a severe impact on agricultural production, the main source of income and employment for 55 percent of economically active people in India (FAO, 2009). Such disasters have a greater impact on rural poor who often do not have enough savings or assets to deal with these shocks. Therefore, in areas that had a disaster, we would expect

higher uptake of NREG as poorer households are likely to recover any loss of income by participating in NREG. Our results confirm that the impact of NREG is greater in regions affected by disasters. We also see an effect of NREG on the wider community as the development of infrastructure such as flood controls provide significant protection and benefits to everyone. Similar results were reported by Desai et al. (2015) who find that the impact of NREG on poverty reduction was greater in regions that had less developed infrastructure.

#### 4.2. Impact on facility delivery by household wealth

As discussed earlier, NREG is designed to provide employment to the most vulnerable sections of the population. There is evidence that NREG, albeit not perfect, is fairly well-targeted and directly benefits the poor and marginalised populations in rural areas (Dey, 2017; Mehrotra, 2008; Ravi and Engler, 2015). There is also evidence that NREG improved wages, child development indicators, and food security among these groups (NCEUS, 2009). However, in our analysis, contrary to the main expectation that the introduction of NREG will lead to an increase in facility deliveries among the poor, we find NREG in fact reduced facility deliveries.

We believe this unintended effect is because workfare programs such as NREG are likely to raise the marginal cost of time for adults in poorer households, thereby negatively impacting activities that limit their time engaged in employment. This can influence the time spent on a variety of activities including the cumulative time spent in travelling to and waiting at health facilities. In essence, although income from employment makes healthcare affordable, it can also put constraints on how households allocate time to other activities. Going to a health facility or accompanying an expectant mother to a facility involves an opportunity cost of forgoing income. As a result, the household may prefer home delivery over delivery at a facility.

Prior research supports this line of reasoning - that in poorer households, women's participation in employment especially through workfare schemes, is often induced by poverty that is likely to have a negative impact on the utilisation of maternal health services (Desai & Jain, 1994; Gabrysch & Campbell, 2009). Studies from two Indian states: Andhra Pradesh and Tamil Nadu (Navaneetham and Dharmalingam, 2002), as well as Nepal (Sharma et al., 2007), show that working women are less likely to seek maternal health services at a facility. This effect has also been observed in the context of welfare schemes in developed countries. For instance, Haider et al. (2003) show that in the US, a welfare reform that was restricted to providing employment to relatively poorer individuals, negatively impacted time spent on maternal and child health activities. Most notably, they found that breastfeeding would have been 5.5 percent higher in the absence of the welfare reform. We also find similar results that indicate NREG had a negative impact on exclusive breastfeeding among poorer households.

#### 4.3. Impact on facility delivery by SC/ST status

Even though the NREG Act (2005) prioritises work on land owned by SC/ST (p13), our analysis does not indicate any effect of NREG on the health-seeking behaviour of SC/STs. On the other hand, we observe an increase of 4.2 percentage points in public facility deliveries of non-SC/STs due to NREG. Once again, even though we do not have evidence for a causal impact of NREG on deliveries at private facilities for non-SC/STs, the results suggest the increase in public facility deliveries could be due to a shift in preference from private to public facilities - much like the impact observed for richer households.

#### 4.4. Limitations and future research

While our study provides insights into the impact of NREG on facility delivery, there are a number of limitations and areas of future research that we would like to highlight. First, in estimating the impact



**Table 5**  
Subgroup analyses: Difference-in-differences estimates.

	(1)	(2)	(3)	(4)	(5)
	Facility	Public	Private	Home	Borrow
<i>Panel A:</i>					
Poor Households (Q1&2)	−0.029*** (0.009)	−0.018** (0.009)	−0.010* (0.005)	0.027*** (0.009)	−0.035 (0.023)
Rich Households (Q4&5)	−0.009 (0.013)	0.040*** (0.013)	−0.051*** (0.013)	0.011 (0.013)	−0.021 (0.018)
<i>Panel B:</i>					
SCST = 1	−0.010 (0.010)	−0.002 (0.010)	−0.009 (0.006)	0.009 (0.010)	0.025 (0.022)
SCST = 0	0.012 (0.008)	0.042*** (0.008)	−0.032*** (0.007)	−0.013 (0.008)	−0.039*** (0.014)

Notes: All models include year and district FEs. Other controls include sex of the child, household head's religion and caste (except Panel B), household size, household wealth (except in Panel A), and mother's characteristics (education, age at birth and number of previous births). Scheduled Castes or Scheduled Tribes (SCST). Standard errors are in parenthesis. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1.

**Table 6**  
Impact of NREG in disaster-prone regions.

	(1)	(2)	(3)	(4)	(5)
	Facility	Public	Private	Home	Borrow
Disaster = 1	0.024** (0.011)	0.037*** (0.011)	−0.015* (0.008)	−0.028** (0.011)	−0.042* (0.022)
Disaster = 0	−0.007 (0.008)	0.019** (0.007)	−0.026*** (0.006)	0.007 (0.008)	−0.013 (0.014)

Notes: All models include year and district FEs. Other controls include sex of the child, household head's religion and caste, household size, household wealth, and mother's characteristics (education, age at birth and number of previous births). Standard errors are in parenthesis.

\*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1.

**Table 7**  
Impact of NREG on exclusive breastfeeding.

	(1)	(2)	(3)
	All sample	Poor households	Rich households
DID	−0.024*** (0.006)	−0.027*** (0.009)	−0.011 (0.012)
District FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	65,949	31,961	18,962
R-squared	0.169	0.179	0.193

Notes: Dependent variable is whether the child was exclusively breastfed for at least six months after birth. Controls include sex of the child, household head's religion and caste, household size, household wealth, and mother's characteristics (education, age at birth and number of previous births). Standard errors are in parenthesis.

\*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1.

of NREG on maternal healthcare, we capture intent-to-treat rather than the impact on actual beneficiaries of the scheme. Second, while district and year FEs control for other ongoing developmental initiatives, our data does not capture all these initiatives. We were able to run a robustness test for the effect of the Janani Shishu Suraksha Karyakram (JSSK), which provides cash transfer for maternal health services at public facilities and find that the DID model adequately controls for this. Another scheme that could have an influence is the National Rural Health Mission (NRHM), which focuses on improving rural public health systems. Since NRHM was implemented in the entire state at once, rather than by districts, the DID estimates should have controlled for this. However, further research, perhaps using data from individual states, to investigate the effect of these initiatives separately would be very useful. Third, by design, we are limited in our analysis to observe

only the early effect of NREG. It is possible that the effect changes over time. [Lanjouw and Ravallion \(1999\)](#) studied patterns of participation in poverty reduction programmes in India and found that although non-poor tend to be the first to benefit when programmes are introduced, the benefits to the poor emerge later. However, in a study of an EGS scheme in Maharashtra, [Gaiha \(2000\)](#) observed inequity between the rich and poor increased over time. In our robustness check, when we use Phase 2 districts as the treatment, we find the impact of NREG is greater than when using Phase 1 districts as treatment. This could imply implementation of NREG improved over time as Phase 2 districts received NREG later and could also be because Phase 2 districts were on an average less backward as compared to Phase 1 districts. Nevertheless, to understand the long-term impacts, further studies would be beneficial. And finally, our attempts at exploring the causal mechanism to explain the results of facility delivery by household wealth is greatly limited by the availability of data. We have used household assets to identify poor and rich households. Assets are commonly used as a proxy for household wealth in low- and middle-income countries – it reflects the relative wealth of the household as compared to other households in the region. Although there may be changes in household income due to NREG, household assets tend to remain stable over time ([Liverpool-Tasie and Winter-Nelson, 2011](#)) and households moving from Q1/Q2 to Q4/Q5 are likely to be very few. Similarly, the proxy variable for disaster-prone areas uses data from only one round of the survey. Researchers are likely to benefit by using a more nuanced approach/data – perhaps using a mixed methods design to investigate these as well as other mechanisms.

## 5. Conclusion

EGS are a popular mechanism often used by policymakers to address issues of income security. According to the [World Development Report \(2014\)](#), in sub-Saharan Africa alone, around 150 EGS are currently active, and [Subbarao \(2003\)](#) enumerates several large-scale EGS programmes in Asia and Latin America from the 1980s and 1990s. While researchers and policymakers are predominantly interested in the impact of these schemes on the primary objective: improvement in income security; our analysis shows, EGSs can also have an impact on health-seeking behaviour – specifically maternal healthcare utilisation. In conclusion, we would like to highlight two such areas of impact of EGS on maternal healthcare as observed from the case of NREG in India. First, we find that there is no significant increase in utilisation of maternal healthcare. This suggests that income security alone does not reduce barriers to utilisation. Second, we find a significant increase in home deliveries amongst poorer households indicating that EGSs may in fact introduce unintended barriers that reduce utilisation and therefore increase inequity. We acknowledge that our study considers

the immediate impact of an EGS in India, however, given the popularity of such schemes, we would like to conclude with a call for more in-depth and long-term research into the impact of EGS on utilisation of maternal healthcare.

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